Mechanically Cleaned Bar Screen:
For the design and supply One (1) Kusters Water ***ProTechtor*™** Multi Rake Mechanical Bar Screen, Model MRS-C 190 X 75/6 or equal, to be **installed by owner**.

1.1 SCOPE OF WORK

A. Supplier shall furnish all labor, equipment, materials, tools, and incidental items required to furnish, inspect installation, startup and give operator training for (1) mechanically cleaned bar screen with installation instructions.

B. Each screen shall be furnished complete with bar rack, dead plate, discharge chute, side frames, covers, rake blades, drive chains, sprockets and bearings, scraper assembly, drive motor, gear reducer, anchor bolts, controls for operation of the screen and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation.

C. Supplier shall confirm all Design Criteria (Table 2.2 B) at jobs site and make needed adjustments to design before manufacturing Bar Screen to ensure correct fit. .

1.2 SUBMITTALS

A. Provide shop drawings and product data for the equipment being furnished, to include at minimum the following:

1. Certified shop drawings showing the details of construction, dimensions and anchor bolt requirements.
2. Complete wiring diagrams detailing all required field connections.
3. Descriptive literature, brochures, and/or catalogs of submitted equipment.
4. Calculations showing the structural capability of the screen framework and bar rack to withstand the maximum possible differential (upstream level 100%, downstream level 0).
5. Complete bill of materials for the equipment.
6. List of Manufacturer’s recommended spare parts.
7. Operation and maintenance manuals
8. Manufacturer’s ISO 9001:2008 certificate of registration
9. Equipment weights and lifting points.
10. Manufacturer’s installation instructions.
11. A copy of Manufacturer’s factory warranty.

1.3 QUALITY ASSURANCE

A. A single manufacturer shall provide all components including but not limited to the screen, motors, gear reducers, controls, and control panels as a complete integrated package to ensure proper coordination, compatibility, and operation of the system.

B. Screen shall be Manufacturer's standard product and only modified as necessary to comply with the drawings, specifications, and specified service conditions.

C. All welding is performed in accordance with American Welding Society (AWS) D1.1 Structural Welding Code.

D. Screen shall undergo a passivation process to ensure maximum resistance to corrosion. All stainless steel surfaces shall be minimum SSPC-SP-6 finish or equal.

E. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly, defective workmanship or materials, and breakage or other failure. Materials shall be suitable for service conditions.

F. All structural members of the equipment shall be designed for shock and vibratory loads. Additionally, the screen shall be designed to withstand the forces generated by maximum operating head without damage to the screen or its structure.

G. Each screen shall have the Manufacturer's name, address, and product identification information on a corrosion resistant nameplate securely affixed to the equipment.

H. Screen manufacturer shall be ISO 9001:2008 certified.

1.4 WARRANTY

A. The equipment shall be warranted by the manufacturer for a period of three (3) year from the date of shipment. Additionally, the lower sprocket bearings shall include a (5) year warranty period from the date of shipment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Shipping

1. Ship equipment, material, and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.

2. Pack spare parts in containers bearing labels clearly designating contents and equipment for which they are intended.

B. Receiving:

1. Supplier shall give 4-four day notice before shipping Bar Screen to Pinecrest Supports & Services Complex, C Wymon Terrell @ 318-641-2288

1.6 OPERATION AND MAINTENANCE MANUALS

A. The manufacturer shall furnish operation and maintenance manuals.

PART 2 PRODUCTS

2.1 BAR SCREEN UNITS

A. GENERAL DESIGN REQUIREMENTS

1. The mechanically cleaned bar screens shall be a self-contained, screening system designed to positively clean and remove debris from the influent flow stream and transport the retained debris to the discharge point. The screen system shall be fully automated and controlled by the manufacturer supplied control system.

2. The bar rack shall extend from the invert of the channel to above the maximum water level where it shall be connected to the screen dead plate on which the screenings will be transported to the discharge apex. The screenings will then be carried into the discharge chute by a passive reciprocating scraper.

3. The screenings shall be mechanically cleaned from the bar rack by a series of engaging rakes carried by two (2) endless roller chains mounted on each side of the screen. The screen frame superstructure shall be constructed such that it forms a strong and rigid internal structure, secured to support beams that span the width of the chamber.

4. The chains shall run over stainless steel drive sprockets keyed to a main, solid, stainless steel drive shaft which shall be mounted in externally mounted bearings and driven by a shaft mounted motor-driven gear unit.

B. DESIGN CRITERIA 2.2 B

Maximum Flow:	1.0 MGD
Headloss at Maximum Flow:	.50”
Channel Width:	1.5’
Channel Depth:	10.33’
Maximum Upstream Water Level:	3.04’
Bar Spacing:	1/4"
Channel Invert to Operating Floor Depth:	10.33
Screen Discharge Height:	5.0’
Screen Incline from Horizontal:	75 degrees
Screen Motor Horsepower:	Minimum 2 HP
Motor Rating:	480v 3ph 60hz
Maximum Rake Speed:	35 fpm
Side Frame Material / Thickness:	3/16”
Roller Track Material / Thickness:	1/4"
Chain material:	304SS
Bar Material:	304 SS
Bar Dimensions:	6mm x 3mm x 40mm
Operational Environment:	Cl. 1 Div. 1

C. PERFORMANCE AND DESIGN REQUIREMENTS

1. Each screen shall be capable of processing the specified peak flow of municipal wastewater with the specified amount of freeboard when installed in the channel at a screen inclination as noted in Table 2.2B. The screen shall lift and discharge screenings at an elevation as specified in Table 2.2 B into the discharge chute without use of brushes or spray washes.

2. The maximum upstream water level shall not exceed that specified in Table 2.2 B. The screen shall be capable of processing the peak flow without exceeding the maximum upstream water level based on a 30% reduction (blinding) of the screens free open area.

3. The travel speed of the cleaning rakes shall be as specified in Table 2.2 B. The bar rack must be continually cleaned by the travelling rakes with a maximum elapsed time between cleaning of 5 seconds.

4. All parts shall be designed and manufactured so the screen structure and bar rack can withstand the hydraulic force exerted by the maximum water depth. All structural and functional parts shall be adequately sized to prevent deflection and vibration which could impair raking operation.

5. All components shall be so designed that jamming at any point will not result in structural failure, but will cause the drive motor to stall. All components, including the gear reducer, shall be designed to withstand, without damage or permanent distortion, the full stalling torque of the drive motor and/or the maximum differential head at any water depth.

D. SCREEN COMPONENTS

1. Screen Frame Assembly

a. The screen frame shall be provided and designed to support all required static and dynamic loads.

b. Screen frame side plates shall be made of the material and thickness specified in Table 2.2 B.

c. The side plates shall be connected with each other through u-channel support members made of minimum 3/16" thick material with a cross section of 4" x 2 ¼".

Each side frame shall include a separate chain guard roller track to guide the rake chains. The roller tracks must support both the upstream and downstream chain lengths and be bolted to the side frames so they can be easily replaced. The roller tracks shall be made of material as specified in Table 2.2 B.

d. Neoprene sealing strips shall be fastened to the side frames to seal the lateral gaps between the side frames and the channel walls.

2. Bar Rack

a. The bar rack shall consist of equally spaced, vertically aligned bars, inclined at the horizontal at the angle described above. The bars shall be spaced as specified in Table 2.2 B.

b. The bars shall be located by a positive retaining plate at the top and bottom of the bar rack. The retaining plates will guarantee the specified bar spacing. The bars must be bolted and singularly replaceable without any welding, cutting, or further disassembly of the bar rack.

c. The lower portion of the bars shall interlock with a curved base plate such that the rakes positively remove all screenings from the entire length of the bar rack.

d. The bar rack shall consist of trapezoidal bars. The bars shall be of the material and thickness specified in Table 2.2 B.

3. Dead Plate

    a. The dead plate will extend fully from the bar rack to the discharge point of the screen. The dead plate shall be made using of a minimum 3/16” or 5 mm thick material as specified.

    b. The dead plate shall be properly stiffened by structural members to ensure it remains flat and true such that the clearance between the dead plate and the rake teeth is a maximum of 1/8” or 3 mm.

4. Shaft, Chains, and Sprockets

    a. Drive chains for the rakes shall be roller type chains manufactured using the material specified in Table 2.2 B. Each chain shall have a minimum breaking load of 25,000 lbf. Chain rollers and pins shall be made of material specified in Table 2.2 B.

    b. The drive chains shall not require lubrication.

    c. The drive shaft shall be supported on each side by an externally mounted, grease lubricated take-up bearing assembly.

    d. The chain shall be guided by the guide tracks mounted on each side frame.

    e. The screen shall be provided with four identical sprockets with 8 teeth and a reference diameter of 13”. The sprockets shall have a minimum thickness of 1-1/8”.

5. Upper and Lower Bearings

    a. Upper bearings shall be ball bearings, greased, and protected by double seals. The bearing diameter shall be a minimum of 2” and mounted in oil-resistant, enamel coated casings supported by a stainless steel take-up frame.

    b. Lower bearings shall consist of a life sealed bushing system. The system shall consist of a stainless steel stub shaft supporting a ceramic collar. The ceramic collar will interface with a high lubricity, low friction composite bushing surface to ensure zero metal to metal contact. This composite bushing must be designed for extreme wear life in highly abrasive, high impact environments. Lower bushings that require any maintenance, or have metal to metal wear shall not be accepted.

6. Screen Rakes

    a. Rakes shall be designed to lift screenings collected on the bar screen and in the openings between the bars the entire length of the screen to the discharge point. To ensure screenings removal, the rakes must project a minimum of ½" into the bar spacing.

    b. Rake frames shall be made of minimum 3/16" thick channel having a cross section of 4 ¼" by 2 3/8". Frame material shall be stainless steel.

    c. Rake blades shall be made using minimum combined thickness ½" stainless steel plates with a minimum width of 6 ¼". Rake blades shall be laser cut to provide a precision tooth profile that matches and engages the bars of the bar rack.

7. Discharge Chute

    a. A discharge chute shall be provided that fully encloses the discharge section of the screen. The discharge chute shall be made of minimum 3/16" or 4 mm thick stainless steel plate.

    b. The height of the discharge chute shall be as specified in Table 2.2 B and shall allow proper discharge into the screenings washer compactor inlet hopper.

8. Scraper Mechanism

    a. A pivoting scraper mechanism shall be provided to clean each rake of collected screenings as it passes and deposit the screenings in the discharge chute without requiring any manual cleaning of the scraper mechanism.

    b. The scraper must be aligned so that no screenings are allowed to carry over and fall back into the flow on the downstream side of the flow.

    c. The scraper frame shall be made of stainless steel and be mounted on a pivot attached to the side frames. The frame shall be fitted with a replaceable UHMWPE scraper blade.

    d. The scraper shall be designed to follow the rotational path of the rakes and return to the resting position with minimal shock.

    e. Scrapers that require a spring or other mechanical damper will not be permitted.

9. Guards and Covers

    a. The portion of the screen above the influent channel level shall be provided with easily removable, properly stiffened stainless steel covers.

    b. The covers shall fully enclose the screen to provide safety and to contain odors. The covers will allow quick access for maintenance to the equipment.

    c. The covers shall be removable to facilitate visual observation by maintenance personnel when required.

10. Drive Assembly

    a. The screen shall be driven by a heavy-duty, shaft-mounted helical bevel gear reducer as manufactured by SEW Eurodrive or equal The gear reducer shall be sized to provide the proper input power and torque to operate the screen and be rated for greater than the nominal horsepower of the drive motor. The AGMA rating of the gear reducer must be Class II, for heavy shock loading or continuous use, with a 2.0 service factor.

    b. The gear reducer shall be capable of providing a minimum rake travel speed 25 feet per minute during continuous operation.

    c. The gear reducer shall be driven by an electric motor. The motor shall be UL rated for the operational environment as specified in Table 2.2 B. The motor shall be rated for a minimum 2 HP, 460V, 60 Hz, 3-phase operation with a minimum service factor of 1.0.

    d. The drive unit shall be affixed with a rotating torque arm connected to forward and reverse overtorque device. The device consists of a spring loaded carrier that is attached to the rotating torque arm and a stationary point on the screen frame. During normal operation the torque device will maintain standard operating position. If any screen rake experiences a jam, the force will cause the torque arm to rotate with the drive shaft, compressing one of the torque tension springs. This motion will cause activation of a proximity sensor which will signal the control system to initiate the clearing mode. If the clearing mode proves unsuccessful then the system shall initiate an alarm signal and lockout the screen unit.

    e. Overload protection systems activated solely by current-sensing detection systems will not be permitted.

    f. Torque monitoring devices that do not monitor both forward and reverse over- current will not be permitted.

2.2 CONTROLS AND INSTRUMENTATION

A. GENERAL

1. The bar screen control panel shall be the supplier's standard UL listed enclosure and wired for 460 volts, 3-phase, 60 Hz electrical service. The enclosure shall be furnished completely pre-wired and tested, requiring only mounting and connection to field mounted electrical devices. The control panel shall include all equipment required to control the bar screen specified herein.

2. The control panel enclosure shall be NEMA 4X, 304 stainless steel and suitable for wall mounting. The enclosure shall house the control devices, relays, terminal blocks, motor starter, and variable frequency drive (VFD). All hinges and latches shall be corrosion-resistant, or equal.

3. The bar screen shall be equipped with an inverter duty motor and shall be controlled by a variable frequency drive (VFD) sized as required. Auto-reversing for the Clearing mode shall be performed through the VFD. Motors shall be suitable for use with variable torque loads.

B. OPERATION

1. The control system shall be equipped with Local-Off-Hand three (3) position selector switch for the screen. In the Off mode the screen will not run. In the Hand mode the screen shall run continuously. In the Local position, the screen will run according to the position of the local control station screen selector switch.

2. When the screen is in Auto mode the screen shall run when initiated by the level control system and/or the 24 hour delay timer. The run time frequency can be adjusted on the 24 hour timer located in the main control enclosure. The screen run time duration can be adjusted on the screen off delay timer located in the main control enclosure.

C. SAFETY FEATURES

1. When a screen jam condition occurs in the screen Hand or Auto mode the controller shall stop the screen motor and activate the Clearing mode relay. Once the clearing mode is activated the screen will operate in reverse for a short duration then revert back to normal operation. If the screen is unable to clear the jam after several attempts, the screen Fail alarm will activate, and lock out the screen.

2. If the screen experiences an overtorque condition during reverse operation of a Clearing mode, the screen fail alarm will activate, and lock out the screen.

3. If a power failure occurs while the screen is running, operation shall resume when power is restored.

4. If a power failure occurs while the screen is in a fail condition, the fail indicator shall reactivate when power is restored.

5. The controller shall provide overload protection for the motors through overload detection in the VFD.

6. Short-circuit protection requires that a properly sized circuit breaker be provided by the Electrical Contractor.

7. Control reset shall be from the main control panel only.

D. COMPONENTS

1. Enclosure

   a. Enclosures shall be NEMA 4X or NEMA 7 or equal, as required, and shall be suitable for wall mounting. Doors shall have corrosion resistant hinges and latches.

   b. Enclosure shall house the circuit breaker, VFD, motor starter, control devices, relays, and terminal blocks.

2. Control Devices

   a. Pilot devices shall be mounted on the enclosure front panel door.

   b. The enclosure shall have indicator lights for screen, On, Off, Jam, and Overload.

   c. Indicator lights shall be LED type. Selector switches shall be heavy duty NEMA type.

   d. Control transformer shall be protected by two (2) primary fuses and one (1) secondary fuse. The 120 volt secondary shall have one leg grounded.

   e. Auxiliary relay contacts shall be included for screen, Run, Off, Jam, and Overload signal outputs. The contacts shall be rated 10 amp, 240 VAC, resistive load.

3. Field Mounted Devices

   a. The upstream level will be monitored using an ultrasonic level sensor. The sensor will be a Siemens Pointek monitoring unit, suitable for 120 VAC power and a Class I, Division 1 hazardous environment.

   b. The torque monitoring device proximity sensor shall be a low voltage inductive non-contacting sensor suitable for Class I, Division 1 hazardous environment.

2.3 MOTORS

A. Drive motor shall be minimum 2 HP. The motor shall be an inverter duty rated motor with a minimum 1.0 service factor, rated for continuous operation. The drive unit, including the reduction gearbox, shall be directly shaft mounted and located in a position to facilitate maintenance.

2.4 SOURCE QUALITY CONTROL

A. Screen system and control panel shall be factory assembled and tested to ensure proper design and satisfactory operation. Equipment shall be shipped in the minimal practical number of pieces for minimal field assembly by the Contractor.

2.5 SHOP PAINTING

A. Stainless steel and other corrosion-resistant surfaces shall not be painted. Gearboxes, Motors, and other manufactured components will receive the manufacturer's standard weather- and corrosion-resistant coating.

2.6 INSTALLATION AND TESTING

A. Supplier shall verify all information listed in DESIGN CRITERIA 2.2 B including dimensions in the field to ensure compliance and fitting of equipment dimensions with the drawings before manufacturing Bar Screen. Supplier shall notify Engineer of any significant deviations.

B. Supplier shall furnish Manufacturer's instructions and shop drawings for installing bar screen. Manufacturer shall supply anchor bolts for the equipment.